



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Berard

SERIAL NO.: 09/852,855 GROUP ART UNIT: 1714

FILED: May 10, 2001 EXAMINER: Wyrozebski

FOR: METHOD FOR EXTRACTING NYLON FROM WASTE MATERIALS

ATTORNEY DOCKET NO.: I4060/198355

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Commissioner for Patents  
P. O. Box 1450 Alexandria,  
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DATE: January 9, 2005

APPEAL BRIEF

Sir:

Applicant respectfully submits this Appeal Brief in accordance with the requirements of 37 C.F.R. § 41.37.

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**I. REAL PARTY IN INTEREST**

The real party in interest in this application is Interface, Inc.

**II. RELATED APPEALS AND INTERFERENCES**

Appellant, appellant's legal representative, and the assignee of this application are not aware of any other prior or pending appeals, interferences, or judicial proceedings that may be related to, directly affect, or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**III. STATUS OF CLAIMS**

Claims 1-13 and 15-20, all of the pending claims in this application, stand finally rejected. The rejections of claims 1-13 and 15-20 are being appealed.

**IV. STATUS OF AMENDMENTS**

No amendments have been filed subsequent to the final rejection.

**V. SUMMARY OF CLAIMED SUBJECT MATTER**

This application contains two independent claims, claim 1 and claim 17, each of which is reproduced below:

1. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature below 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature for a dissolution time of 45 minutes or less, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

Claim 1 is directed to a process for recovering nylon from a material containing it by contacting the material with a particular type of solvent under relatively low temperature and high pressure conditions, for a specified dissolution time, removing the solvent, which now contains the dissolved nylon, from the undissolved material, and cooling the solvent to precipitate the nylon. By using this particular combination of low temperature and high pressure dissolution, it has been found that the dissolved nylon unexpectedly retains much of its original molecular weight, and in fact can have a molecular weight that is improved by comparison to virgin nylon. This results in nylon that can be spun into fiber with good tenacity. As a result, the recycled nylon obtained from Appellant's process has not been downcycled: i.e., nylon that originates as fiber can be recycled for use as fiber. This is a marked improvement over conventional nylon recycling processes.

The invention is described in the specification, *inter alia*, at page 3, line 16 to page 4, line 29. Suitable dissolution temperatures and pressures are described in the specification at page 5, lines 1-15. Contacting times are described in the specification at page 9, lines 1-5.

17. A method for recovering nylon from a nylon-containing material, comprising:

contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C, and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, obtained by either introducing an inert gas into the reactor, increasing the pressure head of the solvent entering the reactor, or both, thereby dissolving the nylon in the alkanol-containing solvent;

removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and

decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.

Claim 17 recites a process similar to that of claim 1, but specifying a lower limit on temperature, and specifying the techniques used to obtain the high pressure dissolution. It is described in the same portions of the specification cited above with respect to claim 1.

## VI. GROUNDS OF REJECTION TO BE REVIEWED

A. The rejection of claims 1-13 and 15-20 under 35 U.S.C. § 112, first paragraph as lacking adequate written description;

B. The rejection of claims 1-11, 13, 15-16, and 18-20 under 35 U.S.C. § 102(e) as anticipated by Yang et al. (U.S. Patent No. 6,036,726);

C. The rejection of claims 10 and 11 under 35 U.S.C. §103(a) as obvious over Yang et al. (U.S. Patent No. 6,036,726) in view of Meyer et al. (U.S. Patent No. 4,334,056);

D. The rejection of claims 10 and 11 under 35 U.S.C. §103(a) as obvious over Yang et al. (U.S. Patent No. 6,036,726) in view of Booij et al. (U.S. Patent No. 5,840,773); and

E. The rejection of claims 12 and 13 under 35 U.S.C. §103(a) as obvious over Yang et al. (U.S. Patent No. 6,036,726) in view of Stott et al. (U.S. Patent No. 2,742,440).

## VII. ARGUMENT

- A. Claims 1-13 and 15-20 are fully supported by adequate written description in the application as filed.

In paragraph 2 of the Office action of April 7, 2005, the Examiner has rejected claims 1-13 and 15-20 as

failing to comply with the written description requirement. The claim(s) contain subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specification of the present invention enables applicants only for temperatures of 130-155°C. Statement of less than 155°C encompasses temperature outside the range taught by the applicants.

Time of less than 45 minutes is also not in the specification.

Claim 1 and newly added claims 18-20 contain new matter limitations.

Final Rejection of April 7, 2005, p. 2

### 1. Claim 17

Appellant argues claim 17 separately because it contains the very temperature range that the Examiner admits on the record is supported by the specification: 130 °C to 155 °C. Moreover, claim 17 does not recite a dissolution time. Appellant respectfully submits that the Examiner has failed to articulate an adequate basis for rejecting this claim under 35 U.S.C. § 112, first paragraph, and that the rejection with respect to this claim should be reversed.

### 2. Claims 1-9, 15, and 16

Appellant argues these claims together because they are the only rejected claims for which the issues of whether (a) the temperature range is supported by

adequate written description and (b) the dissolution range is supported by adequate written description are the same.

- a. The temperature range recited in claim 1 is fully supported by the specification as filed.

Claim 1 recites that the nylon-containing material is contacted with the alkanol-containing solvent at an elevated temperature below 155 °C. The Examiner asserts that this limitation is not supported by adequate written description in the specification. Appellant's specification clearly states that the "use of increased pressure allows operation at temperatures below 160 °C" referring to the dissolution temperature. This is disclosed in the specification at page 5, lines 10-11, and at page 6, lines 27-28. Presumably, therefore, the Examiner would have to agree that a claim limitation that recited dissolution temperatures below 160 °C would be supported by adequate written description, although the Examiner's rejection appears to indicate otherwise. Appellant's specification also discloses dissolution temperatures of 155 °C (specification at page 5, line 8; page 7, Samples 5, 6; page 8, Samples 1A, 1B, 2A, and 2B); 150 °C (specification at page 7, Sample 7); 147 °C (specification at page 9, Sample 3); 145 °C (specification at page 5, line 9 and page 7, Sample 8); 143 °C (specification at page 9, Samples 1, 2); and 130 °C (specification at page 5, line 8). Appellant has therefore disclosed not only the range "below 160 °C," but also a number of different specific temperatures within that range, including 155 °C.

The Examiner correctly states that the standard for assessing the adequacy of the written description provided by the original disclosure for amended claim language is whether the disclosure as filed reasonably conveys that the inventor had

possession of the later claimed subject matter as of the filing date of the application.

*See In re Kaslow*, 217 USPQ 1089 (Fed. Cir. 1983). Despite her correct articulation of the relevant legal standard, the Examiner appears to instead apply an “*ipsissimus verbis*” standard, requiring that the exact words used in the claim be present (as evidenced by the Examiner’s statement that only the range 130 °C to 155 °C is supported by the specification).

Appellant notes that the situation here is directly analogous to that at issue in *In re Wertheim*, 191 USPQ 90 (CCPA 1976). In that case, the written description issue was whether, for a process invention, the disclosure in a prior application of a broad range of solids content from 25% to 60%, along with specific embodiments of solids contents of 36% and 50%, would provide adequate written description for a claimed range of 35% to 60%. The court found the disclosed range to be adequate written description for the claimed range. Similarly, *Wertheim* held that an added claim limitation to a particle size of at least 0.25 mm was supported by a specification that described that the particles may, for example be ground to a particle size preferably within the range of 0.25 to 2.0 mm (reversing the Patent and Trademark Office position that only the range 0.25 mm to 2.0 mm was supported). *Wertheim*, 191 USPQ at 99. *See also Synthetic Industries (Texas), Inc. v. Forta Fibre Inc.*, 224 USPQ 955, 961 (W.D. Pa. 1984).

In this application, Appellant has clearly disclosed possession of the range “below 160 °C” as of his filing date. The specification is unambiguous about this. The specification is also unambiguous that 155°C is an alternative upper limit for the dissolution temperature range. As in *Wertheim*, the disclosure of a possible lower

limit that provides a narrower range does not function to negate the support in Appellant's specification for the range "below 160 °C," including the range "below 155 °C." To the contrary, the disclosure of specific dissolution temperatures below 155 °C, coupled with the disclosure of a dissolution range "below 160 °C," would lead those skilled in the art to conclude that the range of dissolution temperatures "below 155 °C" was a part of Appellant's invention, and in Appellant's possession as of the filing date of this application. As in *Wertheim*, the Examiner has "done nothing more than to argue lack of literal support, which is not enough." *Wertheim*, 191 USPQ at 98. Because the Examiner has failed to establish that the claims lack adequate written description in the specification, the Examiner's rejection of claims 1-9, 15, and 16 on this basis is erroneous and should be reversed.

b. The dissolution time range recited in claim 1 is fully supported by the specification as filed.

Again, the relevant issue is whether the disclosure describes the range of dissolution times sufficiently clearly that one having skill in the art would recognize from the disclosure that Appellant invented the claimed range. See *In re Herschler*, 200 USPQ 711, 717 (CCPA 1979); *In re Smythe*, 178 USPQ 279 (CCPA 1973). As described above, the specification discloses a maximum dissolution time of 45 minutes, and exemplifies four additional dissolution times that are less than 45 minutes. The situation presented by the present facts is directly analogous to that presented in *In re Eickmeyer*, 202 USPQ 655, 662 (CCPA 1979). In that case, the appellant was claiming a process involving a step of contacting "at an elevated temperature of at least about 56 °C." *Eickmeyer*, 202 USPQ at 658. The appellant's

specification contained “replicate tests of the operation of his process at 56 °C” and also at 80 °C, and the court found that it would have been clear to one skilled in the art that appellant considered his hot system to operate at temperatures of at least about 56 °C. *Eickmeyer*, 202 USPQ at 662. In holding that rejections for insufficient enablement were erroneous, and that the above-quoted claim language was supported by the specification, the court stated:

Although appellant may be entitled to claim a range of temperatures below 56 °C, he need not claim all that he is entitled to claim and need have support only for what he does claim. We are not persuaded that there is any requirement for appellant to demonstrate the *criticality* of a lower-limit to meet the description requirement.

*Eickmeyer*, 202 USPQ 662-663 (emphasis in original).

In this case, Appellant has disclosed a dissolution time of 45 minutes. He has also disclosed several dissolution times less than this time. Under the rationale of *Eickmeyer*, it would have been clear to one skilled in the art that Appellant considered his process to operate at dissolution times less than 45 minutes. Appellant is not required to show any criticality for this upper limit, but is merely required to establish its presence in the specification.

For at least the reasons given above, the rejection made by the Examiner that claims 1-9, 15, and 16 are not supported by adequate written description is erroneous and should be reversed.

### 3. Claim 10

Appellant argues claim 10 (an originally presented claim) separately because it recites the temperature range that the Examiner admits on the record to be supported

by the specification, i.e., 130 °C to 155 °C. In this respect, the Examiner's rejection of claim 10 for inadequate written description is erroneous and should be reversed. The issue of whether the limitation on dissolution time is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

4. Claim 11

Appellant argues claim 11 (an originally presented claim) separately because it recites a temperature that is (a) within the range that the Examiner admits on the record to be supported, (b) is explicitly and clearly supported by the specification at page 5, line 9, and (c) is an originally presented claim. *See In re Gardner*, 177 USPQ 396 (CCPA 1973) (Original claims are part of disclosure, and claims equivalent in scope satisfy written description requirement, without more). The Examiner's rejection of claim 11 for inadequate written description is therefore erroneous and should be reversed. The issue of whether the limitation on dissolution time is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

5. Claim 18

Appellant argues claim 18 separately because it recites an upper limit on dissolution time (37 minutes) that is different from that of claim 1 (45 minutes). As explained in *Eickmeyer*, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution times below 37 minutes, which is clearly supported

in the specification at page 9, Run 1. For this reason, the Examiner's rejection of claim 18 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

6. Claim 19

Appellant argues claim 19 separately because it recites an upper limit on dissolution time (23 minutes) that is different from that of claim 1 (45 minutes) or claim 18 (37 minutes). As with claim 18, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution times below 23 minutes, which is clearly supported in the specification at page 9, Runs 2 and 3. For this reason, the Examiner's rejection of claim 19 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

7. Claim 20

Appellant argues claim 20 separately because it recites an upper limit on dissolution time (15 minutes) that is different from that of claim 1 (45 minutes), claim 18 (37 minutes), or claim 19 (23 minutes). As with claims 18 and 19, it is not required that Appellant claim the full range of dissolution times to which he is entitled, or to demonstrate any criticality for the claimed upper limit should he choose not to do so. In this case, Appellant has chosen to claim the range of dissolution

times below 15 minutes, which is clearly supported in the specification at page 9, Run

4. For this reason, the Examiner's rejection of claim 20 for inadequate written description is erroneous and should be reversed.

The issue of whether the limitation on temperature is supported by adequate written description is addressed above with respect to claims 1-9, 15, and 16.

B. Claims 1-11, 13, 15-16, and 18-20 are not anticipated under 35 U.S.C. § 102(e) by Yang et al. (U.S. Patent No. 6,036,726)

In paragraph 4 of the final Office action of April 7, 2005, the Examiner rejects claims 1-11, 13, 15-16, and 18-20 as anticipated under 35 U.S.C. § 102(e), and states that “[t]he discussion of the disclosure of the prior art of YANG from paragraph 2 of the office action dated 7/15/2004 is incorporated here by reference.”

The Office action of July 15, 2004 states:

The prior art of Yang discloses process for recycling of nylon-6,6 articles such as carpets, which articles contain dyes.

According to claim 27 of the prior art of Yang, the process includes the steps of contacting the polyamide with organic solvent at a temperature sufficient to dissolve the polyamide, separating the undissolved carpet materials and colorant, cooling the polyamide solution thereby causing precipitation.

According to the claims of the prior art of Yang, the temperature at which polyamide is dissolved is in a range of 140-220 °C and the precipitation occurs by cooling the polyamide solution to temperature lower than 140 °C. In specific examples, the dissolution temperatures were 140 °C, 160 °C and 180°C (col. 13) at a pressure of 250 psig. Temperature range of 140-155 °C is therefore taught by the prior art of YANG.

In the examples the prior art of Yang utilizes solvent system, which is a mixture of alcohol and water. The alcohols include methanol, ethanol, isopropanol and butanol. . . Since the solvent of the prior art of YANG is the same type of solvent as it is disclosed in present claims, the temperature range overlaps and the type of nylon is the same, then the equilibrium pressure would be an inherent property, which is the property of a solvent.

Rejection dated July 15, 2004, pages 2-3.

1. Claims 1-3, 5-11, 15, and 16

- a. Yang et al. does not disclose an embodiment containing every element of the claims under review, arranged as in the claims under review

For anticipation to occur, every element of the claim must be identically shown in a single reference. *See, e.g., Diversitech Corp. v. Century Steps, Inc.*, 7 USPQ2d 1315, 1317 (Fed. Cir. 1988). In addition, these elements must be arranged as in the claim under review. *See, e.g., In re Bond*, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990). The treatment by a district court of a claim as a mere catalog of separate parts, disregarding the relationship between the parts set forth in the claims was found to have lead to an erroneous conclusion of anticipation in *Lindemann Maschinenfabrick GMBH v. American Hoist and Derrick Co.*, 221 USPQ 481, 486 (Fed. Cir. 1984). More specifically, an anticipation rejection under 35 U.S.C. § 102 is only proper where the asserted reference clearly and unequivocally discloses the claimed invention without any need for picking, choosing, and combining various disclosures within the cited reference. *See In re Arkley*, 172 USPQ 524, 526 (CCPA 1972).

In this application, Appellant has claimed, in claim 1, a process for recovering nylon by contacting the nylon with an alkanol-containing solvent at an increased pressure (i.e., at a pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature). This increase in dissolution pressure allows the dissolution step to be conducted at a significantly lower temperature (i.e., below 155 °C), while

still retaining a relatively short dissolution time (i.e., 45 minutes or less). It is this combination and arrangement of specific ranges for three process parameters that is unrecognized and undisclosed in Yang et al.

Yang et al. disclose a method for decolorizing a solid polyamide by (a) contacting it with an organic solvent composition at a temperature effective to dissolve the polyamide, forming a solution of the colorant and the dissolved polyamide, and (b) separating the colorant from the polyamide. *See* Yang et al., col. 2, lines 6-13. The dissolution temperature is broadly disclosed to be between 140 °C and 220 °C, “preferably about 160 °C – 180 °C.” Yang et al., col. 2, lines 35-38.

However, Yang et al. do not disclose using a pressure that is above the equilibrium vapor pressure of the solvent at the dissolution temperature. The Examiner states that Yang et al. disclose a dissolution pressure of 250 psig, giving the erroneous impression that the same pressure is used for every temperature in the recited temperature range. This is not the case, however. Yang et al. disclose a very broad pressure range “between about atmospheric and about 300 psig, preferably between about atmospheric pressure and 250 psig.” Yang et al., col. 7, lines 2-4. The reason such a broad range is necessary is that Yang et al. disclose a wide variety of different dissolution solvents and a wide range of dissolution temperatures, rather than any suggestion that a dissolution pressure above the equilibrium vapor pressure of the solvent at that temperature should be used. To the contrary, Yang et al. explicitly state:

The pressure at which the solvating step is carried out will depend upon the solvent since the pressure is the result of the solvent vapor pressure.

Yang et al., col. 6, lines 56-58 (emphasis added).

Yang et al. make brief mention that “[e]levated pressure may be that provided by an inert gas, such as nitrogen or argon, or it may be vapor pressure generated by vaporization of dissolution liquids (i.e., solvent vapor pressure). See Yang et al., col. 7, lines 4-8. However, there is no explanation in Yang et al. as to how or why this could or should be done. Yang et al. certainly does not disclose that an inert gas should be used to increase the dissolution pressure above the vapor pressure of the solvent system, that this should be combined with a lowering of the dissolution temperature to below 155 °C, or that doing so would continue to allow the use of short dissolution times.<sup>1</sup> To the contrary, the specific disclosures of Yang et al. clearly suggest using higher dissolution temperatures around or above 160 °C. Yang et al. specifically disclose dissolution temperatures of 170 °C (col. 7, lines 18-19), 160 °C (col. 9, lines 22-23; col. 10, lines 5-6; col. 10, lines 34-35), 159 – 171 °C (col. 11, line 1; col. 11, line 62), 160 – 180 °C (col. 13, lines 10-56). The only example in Yang et al. that discloses a dissolution temperature range anywhere close to Appellant’s is Example 10, which does not use external pressurization, uses the equilibrium vapor pressure of the solvent system to pressurize the autoclave, and uses a dissolution time greater than 45 minutes.

Appellant submits that the Examiner has failed to apply the proper standard for determining anticipation under the precedent cited above. The Examiner does not point to a specific embodiment of Yang et al. that contains every element of

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<sup>1</sup> The Examiner appears to agree with this statement, as she has not rejected claim 12 as anticipated by Yang et al.

Appellant's claims, arranged as in the claims without the need to pick and choose from among widely varying ranges for Appellant's recited process parameters, Instead, the Examiner presented the following instructive chart:

|                      | Present invention                                       | Prior art               |             |
|----------------------|---|-------------------------|-------------|
| Temperature          | <155°C  | 140-160°C               | encompassed |
| Dissolution time     | <45 minutes   | 0.5-60 minutes          | encompassed |
| Polymer              | nylon-6,6   | nylon-6,6               | encompassed |
| Source of polymer    | floor covering material                                 | carpet                  | encompassed |
| Solvent              | Alkanol   | Alkanol                 | encompassed |
| Restr. On solvents   | Alkanol and water                                       | Alkanol and water       | encompassed |
| Restr on solvents    | ethanol, propanol, etc.                                 | ethanol, propanol, etc. | encompassed |
| Restriction          | free of glycols   | no glycols              | encompassed |
| Pressure             | 250 psi or higher                                       | 250 psi                 | encompassed |
| Equilibrium pressure | Inherent, since it is solvent and temperature dependent |                         |             |

Office action dated July 15, 2004, pages 7-8. The chart is self-serving and inaccurate in places (as examples, Appellant's broadest claims do not recite a numerical lower limit for pressure, and Yang et al. disclose the use of glycol solvents at col. 2, lines 52-60 and col. 12, line 13, rather than exclude them). Nevertheless, the chart is indicative of the legal standard applied by the Examiner in reaching her conclusion that the claims are anticipated. For example, the Examiner takes the position that, because the claimed upper dissolution temperature limit of 155 °C is "encompassed" by the range disclosed in Yang et al., it is anticipated. Because the claimed upper limit on dissolution time of 45 minutes is "encompassed" by the range disclosed in Yang et al., it is anticipated. When Appellant asked the Examiner to cite any case law

of which she was aware that supported such a proposition, the Examiner's response was that she was "not obligated to cite any case laws." Office action dated July 15, 2004, page 9.

More telling is the Examiner's statement regarding equilibrium pressure: the Examiner apparently agrees that the equilibrium vapor pressure is a property of the solvent system used in the dissolution process. Basic thermodynamics makes clear that it is also a property of the particular dissolution temperature. As the Examiner indicates, at a particular dissolution temperature, the equilibrium vapor pressure of a particular dissolution solvent is fixed. In an enclosed vessel, at the dissolution temperature, the pressure will reach this equilibrium vapor pressure and go no higher. Appellant's claimed process requires increasing the dissolution pressure above this pressure (e.g., by introducing an inert gas, or increasing the pressure head on the solvent system). Nowhere does Yang et al. suggest doing so in connection with using a dissolution temperature below 155 °C and a dissolution time of less than 45 minutes.

In effect, the Examiner has treated Appellant's claims as a mere catalog of separate process steps, which the Examiner attempts to find by picking and choosing from among the various disclosures of Yang et al., and then asserting anticipation. The Examiner has thus used a standard for determining anticipation that is precluded by the cases cited above (the Examiner's comment at page 5 of the April 7, 2005 Office action that "YANG is one big embodiment" notwithstanding). When the proper standard for anticipation is applied, it is clear that Yang et al. does not disclose the combination of (1) a dissolution temperature below 155 °C, (2) a dissolution pressure greater than the equilibrium vapor pressure of the dissolution solvent at the

dissolution temperature, and (3) a dissolution time of less than 45 minutes. To the contrary, the specific disclosure of Yang et al. cited above makes very clear that, for an alkanol-based solvent system, much higher dissolution temperatures were thought to be needed to obtain acceptable dissolution times. For at least these reasons, the Examiner's anticipation rejection is erroneous and should be reversed.

b. Yang et al. is not enabling for the invention claimed by Appellant

For the Yang et al. patent to be available as an anticipatory reference against Appellant's claims, it must enable a worker skilled in the art to make and use the invention described in those claims. *See, e.g., Akzo N.V. v. U.S. Int'l Trade Comm'n*, 1 USPQ2d 1241 (Fed. Cir. 1986), *cert. denied*, 482 U.S. 909 (1987) (The prior art reference must be enabling, thus placing the allegedly disclosed matter in the possession of the public.); *Chester v. Miller*, 15 USPQ2d 1333 (Fed. Cir. 1990) (To be prior art under section 102(b), the reference must put the anticipating subject matter at issue into the possession of the public through an enabling disclosure.)

Yang et al. does not provide one skilled in the art with an enabling disclosure for the process claimed by Appellant. Nowhere does Yang et al. recognize that, by using an elevated pressure above that of the equilibrium vapor pressure of the solvent at the dissolution temperature, a lower dissolution temperature can be used, while maintaining a short dissolution time. Yang et al., therefore, does not teach one skilled in the art how to achieve such a result.

2. Claim 4

Claim 4 recites that the alkanol-containing solvent is substantially free of glycols or other polyols. Appellant argues this claim separately because Yang et al. fails to explicitly teach such a limitation.

The Examiner states, with respect to Yang et al., that:

There is no teaching of glycols and polyols being used. In fact the prior art of Yang teaches that a glycol was not a good solvent for the nylon-6,6 (col. 12, example 10).

Office action dated July 15, 2004, p. 3. However, what Yang et al. actually state is that:

In this study, ethylene glycol was not a good solvent for nylon 6,6 under the conditions employed. The same was true for glycerol in a subsequent study. It appears that the greater the number of hydroxyl groups on the solvent molecule, the less effective the solvent is in the present process.

Yang et al., column 12, lines 58-64 (emphasis added).

First, whether the disclosure quoted above would dissuade one of ordinary skill from using ethylene glycol as a solvent is questionable, at best. A review of the data in Table 4 (the study referred to in the quote) shows that Sample No. 25 (n-butanol/water) and Sample No. 20 (ethylene glycol/water) dissolved the same amount of fiber (6.98%). Sample No. 27 (n-butanol/water) and Sample No. 30 (ethylene glycol/water) also dissolved the same amount of fiber (11.11%). No test results for ethylene glycol are reported in the table that are analogous to Sample No. 28. Therefore, where results for ethylene glycol are reported, they are the same as for n-butanol. Moreover, Yang et al. specifically discloses the use of diol solvents and their combination with alcohols at column 2, lines 52-60. More disclosure of the use of

diols as suitable solvents occurs at column 6, lines 44-48. This hardly seems tantamount to a disclosure that the alkanol-containing solvent should be substantially free of glycols or other polyols, as recited in claim 4. For this reason, as well as those given above with respect to claims 1-3, 5-11, 15, and 16, Appellant respectfully submits that Yang et al. fails to anticipate claim 4, and that this rejection should be reversed.

3. Claim 13

Claim 13 recites that the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent results from the pressure head of the solvent entering the reactor. The Examiner does not identify anyplace in Yang et al. where such a technique is disclosed. Moreover, a review of Yang et al. indicates that such a disclosure is simply not present. Accordingly, for this reason, as well as those given above with respect to claims 1-3, 5-11, 15, and 16, Appellant respectfully submits that the anticipation rejection of claim 13 is erroneous and should be reversed.

4. Claim 18

Claim 18 recites that the dissolution time is 37 minutes or less. The Examiner has stated:

The time in which YANG achieves dissolution is in a range of 0.5-60 minutes more preferably in a range of 0.5-20 minutes (col. 7, lines 14-16).

Office action dated July 15, 2004, p. 3. As pointed out above, however, Yang et al. does not disclose an embodiment of their process wherein a dissolution time of less than 37 minutes is combined with a dissolution temperature of below 155 °C and a

dissolution pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature. A proper reading of claim 18, incorporating all of the limitations of the claim from which it depends (claim 1) requires that each of these elements be present, arranged as in the claim, in Yang et al. before a rejection for anticipation is proper. Appellant respectfully submits that this is not the case. As a result, the Examiner's anticipation rejection is erroneous and should be reversed.

5. Claim 19

Claim 19 recites that the dissolution time is 23 minutes or less. As with claim 18, Yang et al. does not disclose an embodiment of their process wherein a dissolution time of less than 23 minutes is combined with a dissolution temperature of below 155 °C and a dissolution pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature. A proper reading of claim 19, incorporating all of the limitations of the claims from which it depends (claims 1 and 18) requires that each of these elements be present, arranged as in the claim, in Yang et al. before anticipation can exist. Since they are not so present in Yang et al., Appellant respectfully submits that this rejection is erroneous and should be reversed.

6. Claim 20

Claim 20 recites that the dissolution time is 15 minutes or less. Because Yang et al. does not disclose an embodiment of their process wherein a dissolution time of less than 15 minutes is combined with a dissolution temperature of below 155 °C and a dissolution pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature, this rejection is erroneous and should be reversed.

C. Claims 10 and 11 are not obvious under 35 U.S.C. §103(a) over Yang et al. (U.S. Patent No. 6,036,726) in view of Meyer et al. (U.S. Patent No. 4,334,056)

In paragraph 6 of the Office action of April 7, 2005, the Examiner has rejected claims 10 and 11 as obvious under 35 U.S.C. § 103(a) over Yang et al. in view of Meyer et al., incorporating by reference the discussion of these references in the Office actions of April 7, 2005 (Yang et al. ) and July 15, 2004 (Yang et al. and Meyer et al.).

Apparently recognizing that Yang et al. does not disclose the dissolution temperatures recited in claim 10 (from about 130 °C to about 155 °C) and in claim 11 (about 145 °C), the Examiner turns to Meyer et al. in an attempt to supply this deficiency. The Examiner states:

With respect to the above differences, the prior art of Meyer discloses process for making polyamide powders by dissolving the polyamide polymer in ethanol at a temperature range of 130-150 °C and then cooling it to afford precipitation at a temperature range of 100-125 °C. The precipitated polyamide is then recovered from the ethanol (claim 1).

According to col. 3 of the specification of the prior art of Meyer, the polyamide that can be processed by the process disclosed above can be formed from monomers such as adipic acid and hexamethylene diamine, wherein the two monomers are utilized to form nylon-6,6.

In a narrower embodiment, the prior art of Meyer discloses that the temperature range at which the polyamide dissolves is 138-142°C. Since the present invention teaches about 145°C, then the temperature of 142°C reads on present claims in view of the term “about”.

Office action dated July 15, 2004, p. 4.

The Examiner fails to point out, however, that Meyer et al. is directed to a specific process for producing polyamides having at least 10 aliphatically bound

carbon atoms per carbonamide group that are suitable for forming powder coating compositions. *See* Meyer et al., column 2, lines 42-62. The Meyer et al. specification makes clear that the dissolution temperature ranges are applicable to compounds having at least 10 carbon atoms aliphatically bonded together in the carboxy moiety of the polyamide: Meyer et al. specifically disclose compounds like polylauryllactam and polyundecanoic acid amide as examples of the polyamides contemplated for use in their process. *See* Meyer et al., column 3, lines 38-42. The temperature ranges quoted above and cited by the Examiner are for the dissolution of these long chain monomer polyamides. Meyer et al. disclose that:

Furthermore, the corresponding copolyamides or mixtures of homopolyamides and copolyamides, which contain at least 70° [sic, %] by weight of the polyamides having at least 10 aliphatically bound carbon atoms per carbonamide group may be used. Accordingly, the mixtures of copolyamides can contain from 0 to 30% by weight of one or several comonomers such as caprolactam, hexamethylene diamine, dodecamethylenediamine, isophoronediamine, trimethylhexamethylenediamine, adipic acid, azelaic acid, sebacic acid, dodecanedioic acid or aminoundecanoic acid.

Meyer et al., column 3, lines 43-54. Nowhere does Meyer et al. teach or suggest that nylon 6,6 is present, as alleged by the Examiner in the Office action of July 15, 2004 at page 10. Meyer et al. merely indicates that one or more of the above comonomers can be copolymerized with lauryllactam or undecanoic acid amide or other long chain monomer to form a copolyamide. Nowhere does Meyer et al. teach or suggest that the temperatures disclosed therein for the production of fine grained powders of a specific class of long-chain polyamides could or should be applied to the dissolution of any of the polyamides decolorized in Yang et al.

Put another way, neither reference provides any motivation for one of ordinary skill in this art to take the disclosure of Yang et al. of particular (high) dissolution temperatures for use in decolorizing particular polyamides, disregard that teaching, and substitute for that teaching a lower temperature range disclosed in Mayer et al. as suitable for dissolution of a completely different type of nylon for a purpose (producing a fine grained powder) completely different from that of dissolving the polyamide in Yang et al. (decolorization). Moreover, this motivation is not provided by the knowledge of one of ordinary skill in the art, or from the nature of the problem to be solved (which is different in both cited references). See *Sibia Neurosciences, Inc. v. Cadus Pharmaceutical Corp.*, 55 USPQ2d 1927 (Fed. Cir. 2000).

Absent some motivation to modify the process disclosed in Yang et al. in the manner suggested by the Examiner, Appellant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness.

Moreover, even if one were to make the combination of reference teachings that the Examiner suggests, one would not obtain Appellant's claimed invention. Even combined, the teachings of Yang et al. and Meyer et al. fail to teach or suggest that the combination of a dissolution temperature in the recited range with a pressure increased above the vapor pressure of the solvent will result in decreased dissolution times, as recited in Appellant's claims. There is simply no disclosure or suggestion of such a result in either reference. For this reason as well, Appellant respectfully submits that the Examiner has failed to establish a *prima facie* case of obviousness.

Appellant respectfully submits that, for at least these reasons, the Examiner's obviousness rejection of claims 10 and 11 is erroneous and should be reversed.

D. Claims 10 and 11 are not obvious under 35 U.S.C. §103(a) over Yang et al. (U.S. Patent No. 6,036,726) in view of Booij et al. (U.S. Patent No. 5,840,773)

In paragraph 7 of the Office action dated April 7, 2005, the Examiner has rejected claims 10 and 11 as obvious under 35 U.S.C. § 103(a) over Yang et al. in view of Booij et al., incorporating by reference the discussion of these references in paragraphs 2 and 5 of the Office action dated July 15, 2004. In paragraph 5 of the July 15, 2004 Office action, the Examiner states:

The discussion of the disclosure of the prior art of Meyer [sic, Yang et al.] of this office action is incorporated here by reference.

The difference between the present invention and the disclosure of the prior art of Meyer [sic, Yang et al.] is the recitation of narrower temperature range capable of dissolving and precipitating the polyamide.

With respect to the above differences, the prior art of Booij discloses process for recycling polyamide from carpet scrap containing nylon-6 and nylon-6,6.

The process of Booij according to the claims of the prior art the solvent utilized to dissolve the polyamide is alcohol selected from the group consisting off methanol, ethanol and propanol. In narrower embodiment (claim 3) this alcohol is mixed with water.

The temperature at which the nylon-6,6 is dissolved is in a range of 135-140°C (claim 13) or 155-165°C (claim 17). According to the example III, the solution was cooled to 25°C to precipitate the white polyamide powder.

The temperatures of the alcohol/water mixture can be as low as 135°C and still effectively dissolve the polyamide.

In light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to utilize temperature range of the prior art of Booij to dissolve the polyamide of Yang and thereby obtain the claimed invention. Utilizing the temperatures of Booij would still dissolve the nylon-6,6 of Yang. In addition the temperature ranges of the prior art of Yang overlap with the temperature ranges of Booij.

Office action dated July 15, 2004, pp. 5-6.

Booij et al. does not cure the deficiencies of Yang et al. noted above with respect to the Examiner's anticipation rejection, namely the failure to teach or suggest that the combination of low dissolution temperature (below 155 °C) and high pressure (above the equilibrium vapor pressure of the solvent at the dissolution temperature) provide dissolution in short times (less than 45 minutes). To the contrary, Booij et al. state:

The pressure employed for the extraction is not critical. The extraction is preferably carried out at an elevated pressure. The minimum pressure used depends on the vapor pressure of the extraction agent at the temperature of the extraction. If methanol is used as the extraction agent, the preferred pressure during the extraction is about 0.2 MPa to about 2 MPa (gauge), and more preferably about 0.5 MPa to about 1.5 MPa. It is particularly advantageous to select a pressure that is the same as the vapor pressure of the extraction agent at the temperature of the extraction. The pressure need not be controlled separately in such a case.

Booij et al., column 5, lines 5-15 (emphasis added). Booij et al. thus teach (1) pressure is not critical, and (2) to the extent selecting a pressure is necessary, it is better to select a pressure at the equilibrium vapor pressure of the solvent system, because then the pressure need not be separately controlled. Based on this, it seems clear that Booij et al. teach away from Appellant's invention, and from any modification of Yang et al. that would result in Appellant's invention.

The Examiner's response to these arguments has been:

With respect to the above argument, the pressure of the present invention is not a subject matter of independent claims. Furthermore the two features are disclosed by YANG. BOOIJ was utilized just like MEYERS for the purpose of narrower temperature range for the dissolution of polyamides.

Office action dated April 7, 2005, p. 9. These comments raise two issues with respect to the Examiner’s reasoning in making this obviousness rejection.

First, the statement that pressure is not a subject matter of the independent claims is false. Both claims 1 and 17 explicitly recite that the dissolution is carried out at a pressure that is higher than the equilibrium vapor pressure of the solvent at the dissolution temperature (directly contrary to what Booij et al. teach).

Second, the Examiner’s apparent logic that she is justified in ignoring this teaching in Booij et al. because it is not the reason for which she cited Booij et al. runs directly contrary to long-established law. *See, e.g., Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.*, 227 USPQ 657, 666 (Fed. Cir. 1985), *cert. denied*, 475 U.S. 1017 (1986) (A reference must be considered for all it teaches, including disclosures that teach away from the invention as well as disclosures that point toward the invention); *W. L. Gore & Assoc., Inc. v. Garlock, Inc.*, 220 USPQ 303, 311 (Fed. Cir. 1983). In *In re Kuderna*, 165 USPQ 575, 578-79 (CCPA 1970), the type of “picking and choosing” analysis in which the Examiner has engaged was prohibited:

We must approach the issue of patentability in terms of what would have been obvious to one of ordinary skill in the art at the time the invention was made in view of the *sum* of all the relevant teachings in the art, not in view of first one and then another of the isolated teachings in the art.

*Kuderna*, 165 USPQ at 578-79 (emphasis in original). The issue here is whether the Examiner’s subjective reason for citing Booij et al. is sufficient to justify ignoring other, inconvenient teachings in Booij et al., or whether one of ordinary skill in the art must be considered to have in view of all of the teachings of Yang et al. and Booij et

al. (including those that inconveniently do not support the Examiner's position), and whether such a person, in view of all of the reference teachings, would have been motivated to combine the reference teachings and modify the process taught in Yang et al. in the manner that the Examiner suggests. The cases cited above make it clear that the latter is the appropriate standard to be applied.

Appellant has explained above why Yang et al. fail to teach or suggest using a dissolution pressure higher than the equilibrium vapor pressure of the solvent at the dissolution temperature. Booij et al. does nothing to remedy this deficiency. In fact, when the appropriate legal standard is followed, it is clear that Booij et al. teaches one of ordinary skill in the art that dissolution pressure is not critical, and that a pressure at the equilibrium vapor pressure of the solvent is better than any other pressure, since it need not be separately controlled.

By contrast, Appellant has disclosed that the use of a dissolution pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature enables one to, surprisingly, use lower dissolution temperatures than those specifically disclosed in Yang et al., while still maintaining short dissolution times. Appellant's claims recite this combination of parameters. In light of these critical differences between Yang et al. and the invention claimed in claims 10 and 11, and in light of the teaching of Booij et al. away from doing what Appellant has disclosed and claimed, Appellant respectfully submits that one of ordinary skill in this art would not have been motivated to modify the teachings of Yang et al. in the manner that the Examiner suggests. As a result, the Examiner has failed to establish a *prima facie*

case of obviousness, and the obviousness rejection of claims 10 and 11 is erroneous and should be reversed.

E. Claims 12 and 13 are not obvious under 35 U.S.C. §103(a) over Yang et al. (U.S. Patent No. 6,036,726) in view of Stott et al. (U.S. Patent No. 2,742,440)

In paragraph 8 of the Office action dated April 7, 2005, the Examiner has rejected claims 12 and 13 as obvious under 35 U.S.C. § 103(a) over Yang et al. in view of Stott et al., incorporating by reference the discussion in paragraphs 2 and 6 of the Office action dated July 15, 2004. Paragraph 6 of that Office action is reproduced below for convenience:

The discussion of the disclosure of the prior art of Yang from paragraph 2 of this office action is incorporated by reference.

The difference between the present invention and the disclosure of the prior art of Yang is the presence of inert gas.

With respect to the above difference the prior art of Scott (sic, Stott) discloses process, which includes steps of dissolving the polyamide in alcohol and water at elevated temperatures. The polyamide is cooling precipitates polyhexamethylene adipamide, which is also known as nylon-6,6. The alcohols are selected from methanol, ethanol and propanol. The process of the prior art of Scott (sic, Stott) is conducted in a closed container and under nitrogen. Presence of higher pressures is therefore obvious, since the temperatures are higher, additional component (nitrogen gas) is introduced and the container is closed.

Introduction of nitrogen not only increases pressure but it also provides non-oxidizing atmosphere during dissolution and precipitation of the nylon. Oxidation of nylon would degrade the polymer.

In the light of the above disclosure, it would have been obvious to one having ordinary skill in the art at the time of the instant invention to conduct the process of Yang under inert atmosphere as it is disclosed in Scott [sic, Stott] and thereby obtain the claimed invention. Utilizing inert atmosphere would prevent oxidation of polyamide and thereby it would prevent polymer degradation.

Office action dated July 15, 2004, pp. 6-7.

1. Claim 13

Nothing in the Examiner's statements regarding the teachings of Stott et al. indicates any teaching in either Stott et al. or in Yang et al. that dissolution pressure should be increased by using the pressure head of the alkanol-containing solvent stream entering the dissolution chamber. As a result, Appellant is at a loss to understand why claim 13 was included in this rejection. Appellant respectfully submits that the rejection of this claim should be reversed.

2. Claim 12

Again, the Examiner chooses to consider only that portion of the cited reference that supports her position, while ignoring portions of the reference that teach away from the invention. Stott et al. disclose that:

In carrying out this invention, temperatures considerably above the normal boiling point of the alcohol-water mixture, must be employed to dissolve the nylon. The temperatures at which solution takes place range from about 160 °C for a methyl alcohol-water mixture to about 190 °C for an amyl alcohol-water mixture.

Stott et al., column 2, lines 23-28. Appellant claims dissolution temperatures below 155 °C. The Examiner dismisses this issue, stating:

With respect to the above argument, the prior art of STOTT was utilized to provide limitation of dependent claims, which limitation is presence of inert gas. IT was not utilized for the recitation of the temperature range.

Office action dated April 7, 2005, p. 10. However, the issue here is not the Examiner's subjective intention in citing the Stott et al. reference, but whether the

teachings of that reference are properly combinable with those of Yang et al., and if so, what result is fairly suggested to one of ordinary skill in the art.

As with Booij et al., above, if the appropriate legal standard is applied, one of ordinary skill in the art would have looked at all of the disclosure of the Stott et al. patent, not just the portion that the Examiner cites as supporting her position. This worker, if he or she would have been motivated to combine the teachings of Stott et al. with those of Yang et al., would not have obtained the process claimed by Appellant, but rather a process where the much higher dissolution temperatures of Stott et al. are used.

Moreover, Stott et al. do not disclose any connection between the use of a pressure above the equilibrium vapor pressure of the solvent at the dissolution temperature, the use of a dissolution temperature below 155 °C, and the obtaining of short (less than 45 minute) dissolution times, as recited in Appellant's claims. Again, even if the reference teachings were combined in the manner that the Examiner suggests, the result is not Appellant's claimed invention.

For each of these reasons, the Examiner has not established a *prima facie* case of obviousness, and this rejection is erroneous and should be reversed.

F. The declaration of Lees rebuts any prima facie case of obviousness that might be said to exist

In a supplemental response filed on March 11, 2005, Appellant submitted a declaration under 37 C.F.R. § 1.132 by Donald Lees in order to further show the unobvious nature of Appellant's invention. The Lees declaration evaluates the nylon obtained from carrying out the process of Appellant's claims, namely by heating a

mixture of ethanol and sheared nylon 6,6 from carpet waste at a temperature between 138 °C and 143°C (below 155 °C) a pressures between 425 psig and 460 psig (above the equilibrium vapor pressure of ethanol at the dissolution temperatures, which is about 113 °C) in a coiled tube heat exchanger for a dissolution time of less than 45 minutes. The resulting solution was strained to remove undissolved solids and flashed in a crystallizer to a temperature of between 115 °C and 125 °C. The resulting nylon was separated, dried, and extruded to form nylon fiber. The tenacity of the resulting fiber was tested, and unexpectedly found to be above that of the tenacity for nylon fiber extruded from virgin (unrecycled) nylon. The resulting fiber was spun into yarn and incorporated into carpet, whose properties were also evaluated. This evaluation indicated that nylon produced according to Appellant's claims was suitable for forming into fiber for use in carpet.

This suitability was unexpected because one of ordinary skill in the art would have expected significant degradation of the molecular weight of the nylon as the result of its prior use, as well as from the dissolution and recovery process. None of the prior art cited by the Examiner teaches or suggests that a dissolution/recycling process can produce nylon with a molecular weight that is at the upper limit of the molecular weight range of virgin nylon. Appellant submits that this evidence of unexpectedly different result, when considered with the prior art that the Examiner relies upon, constitutes a "secondary consideration" that leads one of ordinary skill in the art to the conclusion that Appellant's claimed invention would not have been obvious. *See In re Rinehart*, 180 USPQ 143 (CCPA 1976).

The Examiner entered and considered the declaration, stating:

Applicant's declaration although very insightful provides information about properties not previously disclosed or described in the specification. Applicants declaration is not commensurate with the scope of the invention and it is not clear how such declaration would aid in process of overcoming prior art of record.

Office action dated April 7, 2005, p. 4.

With regard to the Examiner's comment that the declaration provides information about properties not previously disclosed or described in the specification, Appellant notes that the relevant test is not whether there is exact language support in the specification for the advantages shown in the Lees declaration, but rather whether the advantages shown in the Lees declaration inherently flow from a basic property or utility disclosed in the specification. *See In re Davies*, 177 USPQ 381, 384-85 (CCPA 1973); *In re Zenitz*, 142 USPQ 158, 160-61 (CCPA 1964) (Separation of hypotensive and tranquilizing activity and minimized hypotensive activity inherently flowed from disclosure in specification of use of compounds as tranquilizers); *Ex parte Sasajima*, 212 USPQ 103, 104 (Bd. Of App. 1980) (Undisclosed toxicity advantages inherently flow from disclosure of use as pharmaceutical); *In re Lorenz*, 142 USPQ 101, 104 (CCPA 1964) (There is no requirement that superiority over prior art be disclosed in the original application; it is enough if the basic property or utility is disclosed).

In this application, the basic utility and properties disclosed in the specification include the use of the recovered nylon as fiber due to its retention of molecular weight, described, *inter alia*, at page 3, lines 20-29. The specification describes that, with respect to nylon recycled from fibers that had been previously used in, e.g., floor

coverings, one of ordinary skill in the art would expect that the molecular weight of the recycled nylon to be significantly decreased when compared to virgin nylon. This can occur as the result of a variety of causes, including the original high temperature extrusion process, exposure of the nylon to various environmental conditions, the extraction or dissolution process, and reextrusion of the recovered nylon into fiber. The cumulative effect of this degradation generally renders post-consumer recycled nylon unsuitable for use in fiber, and thus results in a downcycling of the nylon. *See* the specification at p. 2, line 20 to p. 3, line 13. Appellant explains in this portion of the specification that the process of the invention allows the nylon present in floor coverings to be recycled without being downcycled, and that this results from the ability of the claimed process to avoid degrading the molecular weight of the nylon. *See* the specification at p. 3, lines 22-29; p. 5, line 25 to p. 6, line 7; and p. 6, line 27 to p. 7, line 3.

The Lees declaration reports results for testing of tenacity of fiber prepared according to the method claimed by Appellant. Fiber tenacity is strength per unit size of the fiber, and is a property frequently used to evaluate and describe fibers. Those of ordinary skill in the polymer or fiber art know that increasing the strength of a particular type of fiber often requires increasing the molecular orientation of the polymer molecules, and maintaining a high molecular weight of the polymer; short (low molecular weight polymer chains) are less able to orient properly and provide less contribution to the overall strength of the fiber. Tenacity, therefore, provides direct information about the strength properties of the fiber and its ability to perform in a particular application (e.g., as part of a carpet yarn). Tenacity also provides

information about the molecular weight of the polymers making up the fiber, as higher molecular weight polymers tend to form fibers having higher tenacities.

Appellant respectfully submits that an improvement in tenacity for fiber produced by the claimed process inherently flows from Appellant's repeated disclosure in the specification that the claimed process is suitable for the recycling of carpet fiber nylon into nylon suitable for re-extrusion into fibers. As a result, the unexpected improvement in properties should have been considered by the Examiner in evaluating the propriety of her obviousness rejections.

The Examiner has also indicated, without any detailed explanation, that the "declaration is not commensurate with the scope of the invention." Appellant has shown that, by operating within the claimed parameters, he is able to achieve a fiber tenacity higher than most, if not all, available virgin nylon products. The Yang et al. publication discloses that a change of 5% in molecular weight during the dissolution process alone is acceptable. One of ordinary skill in the art would reasonably expect that this 5% degradation, coupled with the degradation that occurs during the initial extrusion and use of the fiber, would result in a recycled nylon tenacity below that of virgin nylon, not at the upper limit of what is found for virgin nylon. It is not necessary that Appellant test every possible temperature, pressure, and dissolution time combination within the scope of the claims, as the Examiner appears to imply, since the specification makes clear that at temperatures below 155 °C and at high dissolution pressures, relative viscosity (an indicator of average molecular weight) increases as compared to higher dissolution temperature, lower dissolution pressure processes. *See* the specification at page 7, lines 17-29. As a result, the results

provided in the Lees declaration can reasonably be extended to show the unobviousness of the broader claimed range of temperatures. *See In re Clemens*, 206 USPQ 289 (CCPA 1980).

Appellant respectfully submits that the declaration of Lees shows that the use of low dissolution temperatures (below 155 °C) combined with high dissolution pressures (above the equilibrium vapor pressure of solvent at the dissolution temperature) for short dissolution times (less than 45 minutes) yields nylon that is not only suitable for extrusion and reuse as nylon fiber, but has a fiber tenacity higher than what would be obtained for most virgin nylon. Nowhere is this suggested in any of the references cited by the Examiner. Such a result is completely unexpected, and is strong evidence of the nonobvious nature of the claimed invention.

## **CONCLUSION**

For the reasons given above, Appellant respectfully submits that all of the Examiner's rejections should be reversed, and that all of the claims of this application are allowable over the art of record.

## VIII. CLAIMS APPENDIX

1. A method for recovering nylon from a nylon-containing material, comprising:
  - contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature below 155 °C and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature for a dissolution time of 45 minutes or less, thereby dissolving the nylon in the alkanol-containing solvent;
  - removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and
  - decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.
2. The method of claim 1, wherein the nylon-containing material comprises a floor covering material.
3. The method of claim 1, wherein the nylon is nylon 6,6.
4. The method of claim 1, wherein the alkanol-containing solvent is substantially free of glycols or other polyols.
5. The method of claim 1, wherein the alkanol-containing solvent comprises an alkanol selected from the group consisting of methanol, ethanol, propanols, butanols, and mixtures thereof.

6. The method of claim 1, wherein the alkanol-containing solvent comprises a mixture of alkanol and water.
7. The method of claim 6, wherein the alkanol is present in an amount ranging from about 40 wt% to about 90 wt% of the solvent.
8. The method of claim 7, wherein the alkanol-containing solvent comprises a mixture of about 80 wt% ethanol in water.
9. The method of claim 1, wherein the pressure during the contacting ranges from about 250 psig to about 600 psig.
10. The method of claim 1, wherein the elevated temperature ranges from about 130 °C to about 155 °C.
11. The method of claim 10, wherein the elevated temperature is about 145 ° C.
12. The method of claim 1, wherein the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature is attained by introducing an inert gas into the reactor.
13. The method of claim 1, wherein the pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature results at least in part from the pressure head of the alkanol-containing solvent entering the reactor.

14. Canceled
15. The method of claim 1, wherein the nylon-containing waste material comprises nylon-containing floor covering materials which comprise carpet or carpet tile, or mixtures thereof.
16. The method of claim 15, wherein the carpet or carpet tile contains nylon 6,6.
17. A method for recovering nylon from a nylon-containing material, comprising:
  - contacting the nylon-containing material with an alkanol-containing solvent at elevated temperature between about 130 °C and about 155 °C, and at a pressure higher than the equilibrium vapor pressure of the alkanol-containing solvent at the elevated temperature, obtained by either introducing an inert gas into the reactor, increasing the pressure head of solvent entering the reactor, or both, thereby dissolving the nylon in the alkanol-containing solvent;
  - removing the alkanol-containing solvent containing dissolved nylon from any undissolved solids; and
  - decreasing the temperature of the alkanol-containing solvent containing dissolved nylon to precipitate the dissolved nylon.
18. The method of claim 1, wherein the dissolution time is 37 minutes or less.
19. The method of claim 18, wherein the dissolution time is 23 minutes or less.

20. The method of claim 19, wherein the dissolution time is 15 minutes or less.

## IX. EVIDENCE APPENDIX

A copy of the declaration of Donald Lees, filed under 37 C.F.R. § 1.132 and entered and considered by the Examiner, is attached hereto.

X. RELATED PROCEEDINGS APPENDIX

None.

The Commissioner is hereby authorized to charge any deficiencies or credit  
any overpayment to Deposit Order Account No. 11-0855.

Respectfully submitted,



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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANTS: Berard

SERIAL NO.: 09/852,855 GROUP ART UNIT: 1714

FILED: May 10, 2001 EXAMINER: Wyrozebski Lee

FOR: METHOD FOR EXTRACTING NYLON FROM WASTE MATERIALS

ATTORNEY DOCKET NO.: I4060/198355

I hereby certify that this correspondence is being deposited with the United States Postal Service as certified first class mail in an envelope addressed to: Commissioner of Patents, P. O. Box 1450, Alexandria, VA 22313-1450, on ~~January 18, 2005~~  
March 11

Donald Lees

Commissioner for Patents  
P. O. Box 1450 Alexandria,  
VA 22313-1450

DATE: January 18, 2005

DECLARATION UNDER 37 C.F.R. § 1.132

Sir:

I, Donald Lees, declare as follows:

1. I am currently employed as Senior engineer [insert title] by Interface, Inc., the assignee of the above-mentioned patent application, and have been employed in this capacity for 3 years.
2. Prior to my employment with Interface, Inc., I was employed as an engineer by Lockwood Greene.

3. I have been involved in design, scale-up, and testing of the process described in the above-mentioned patent application for 3 years, first as an engineer at Lockwood Greene and then as an engineer at Interface, Inc.

4. The testing described herein was carried out by me or at my direction.

5. Sheared nylon 6,6 fibers from waste carpet was air elutriated and mixed with an ethanol solvent at a concentration of approximately 2.75 wt%. This mixture was heated to a temperature between about 138 °C and 143 °C at a pressure between about 425 psig and 460 psig in a coiled tube heat exchanger for less than 45 minutes (at a flow rate of between 1.32 gpm and 1.5 gpm). The equilibrium vapor pressure for ethanol at these temperatures is approximately 113 psig. The resulting solution was strained to remove undissolved solids, and flashed into a crystallizer tank at a temperature of about 115 °C to about 125 °C. The precipitated nylon was concentrated, dried and obtained as powdered nylon. In order to efficiently dry the material, nylon obtained from a previous run through the process was backmixed into the concentrated nylon/solvent stream fed to the drier.

6. At my direction, the nylon powder was further dried to a moisture content of 500 ppm, pelletized, and extruded through a filter pack and spinnerette to produce nylon fiber. At my direction, the denier and tenacity of this fiber were tested. The denier was found to be 2429 and the tenacity was surprisingly found to be 3.11 lb. This tenacity is surprisingly good because it is at the upper limit for tenacity specifications for drawn virgin nylon fiber.

7. At my direction, the nylon fiber obtained above was spun into yarn and tufted into Lutradur primary carpet backing having a Glasbac backing, at a face weight of 17 oz/yd<sup>2</sup>.

8. At my direction various tests were performed on the resulting carpet, which are provided in the table below.

| TEST                         | RESULT           |
|------------------------------|------------------|
| Art 5 yr (Dry) Maintenance   | 8.25             |
| Art 5 yr (Wet) Maintenance   | 8                |
| Burrough's Resistance        | 9083 meg         |
| Delamination - Dry           | No separation    |
| Fluorine                     | 2322             |
| IBM Resistance               | 3783 meg         |
| Light Fastness               | 2-3 (60 AFUs)    |
| Nitrogen Dioxide             | 4-5 (2 cy.)      |
| Ozone Fading                 | 4-5 (2 cy.)      |
| Radiant Panel                | .70              |
| Radiant Panel - 15 min.      | .78              |
| Smoke - Flaming              | 166              |
| Smoke - Flaming - 4 min.     | 131              |
| Smoke - Non-flaming          | 438              |
| Smoke - Non-flaming - 4 min. | 66               |
| Stain (red dye 40) - 24 hour | 10               |
| Tuftbind -Dry                | 8.66 lb          |
| Vetterman Drum               | 1.5 @ 22,000 cy. |

9. These tests indicate that fiber prepared according to the process claimed in the above-mentioned patent possesses properties making it suitable for use as carpet fiber. This is surprising because it would have been expected that degradation of fiber properties during intial use as carpet face cloth would diminish the utility of the fiber for carpet facecloth.

10. I further declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and further that the foregoing statements were made with the knowledge that willful false statements and the like so made are punishable by fine, or imprisonment, or both, under 18 U.S.C. § 1001, and that such willful false statements may jeopardize the validity of the above-referenced application or any patent issuing thereon.

Date: 1/13/05

Signed: Donald W. Lees  
Donald Lees